

EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the measured performance against the requirements.

Highlights:

- All test results were stable – **all "adequate" or better!**
- Results are available on the new (and improved) web site:
<http://ensight.eos.nasa.gov/Networks/emsnet/index.shtml>. Also check out the improved "Integrated" web site (still under development):
http://ensight.eos.nasa.gov/integrated_measurements.shtml. It adds the user flows to the iperf measurements in plotting the graphs
- Ratings to EDC and NSIDC are now based on testing from the new GSFC Performance Test Host, outside the ECS firewall. Results are higher than from the GDAAC, and are reported in the detail sections below.

Ratings:

Rating Categories:

Excellent : Total Kbps > Requirement * 3
Good : $1.3 * \text{Requirement} \leq \text{Total Kbps} < \text{Requirement} * 3$
Adequate : $\text{Requirement} < \text{Total Kbps} < \text{Requirement} * 1.3$
Low : Total Kbps < Requirement.
Bad : Total Kbps < Requirement / 3

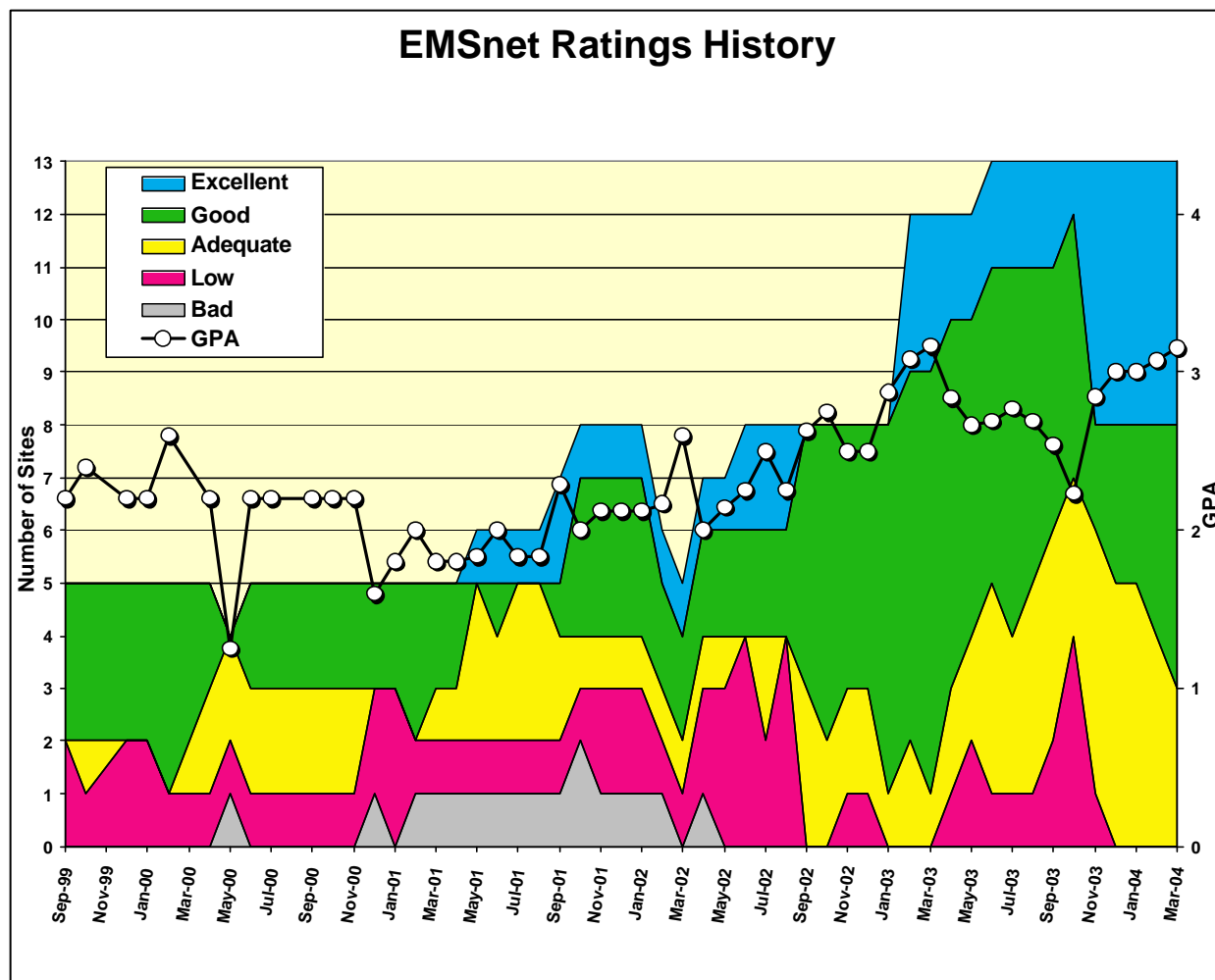
Where Total Kbps = User Flow + iperf monthly average

Ratings Changes:

Upgrades: ↑

GSFC → LaRC: Adequate → **Good**

Downgrades: ↓: None



The chart above shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0

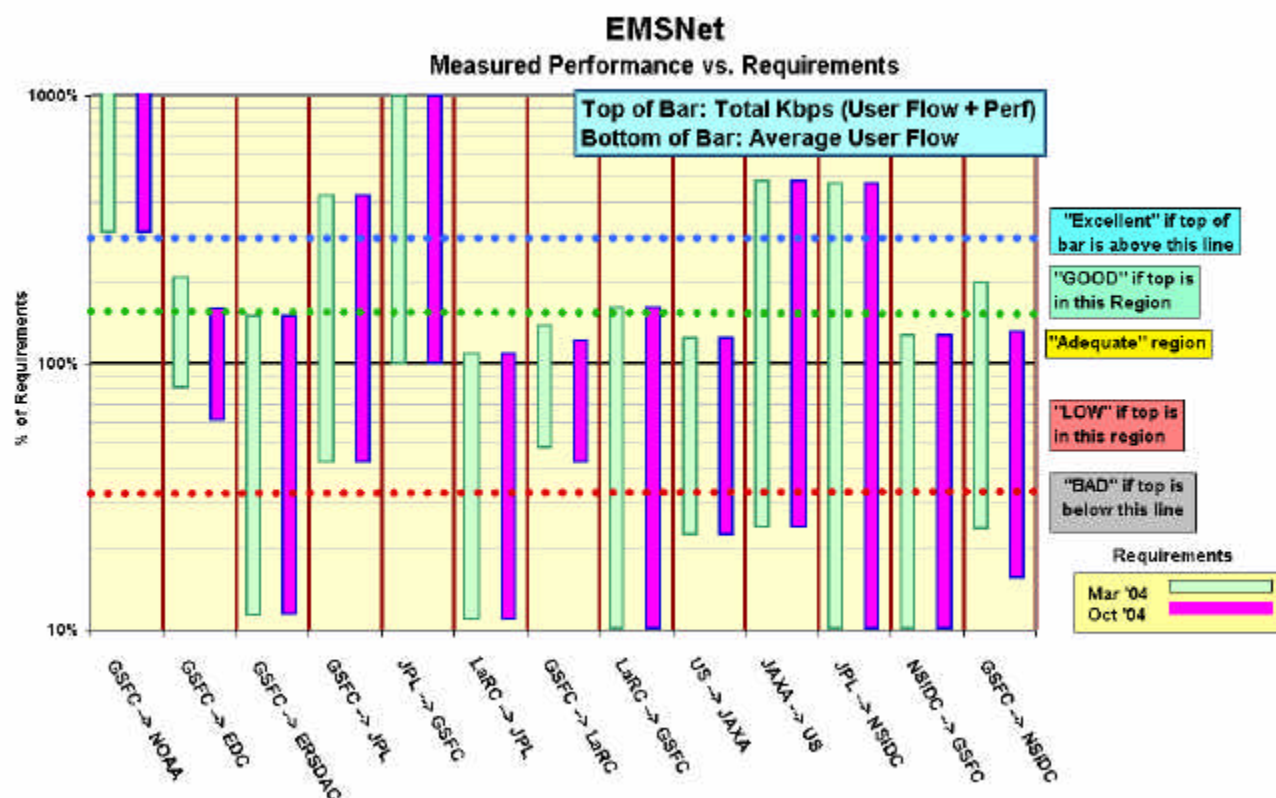
EMSnet Sites

Network Requirements vs. Measured Performance

March 2004		Requirements (kbps)		Testing						
Source → Destination	Team (s)	Current	Future	Source → Dest Nodes	Avg User Flow kbps	Perf Avg kbps	Total Avg kbps	Current Status re	Prev Stat	Current Status re
		Mar-04	Oct-04					Mar-04		Oct-04
GSFC → NOAA	Quikscat	189	189	GSFC-CSAFS → NESDIS	579	2929	3508	Excellent	E	Excellent
GSFC → EDC	MODIS, LandSat	216611	285361	GSFC-PTH → EDC DAAC	172617	279244	451861	GOOD	G	GOOD
GSFC → ERSDAC	ASTER	568	568	GDAAC → ERSDAC	64	786	850	GOOD	G	GOOD
GSFC → JPL	ASTER, QuikScat, MLS, etc.	1601	1597	CSAFS → JPL-SEAPAC	669	6076	6745	Excellent	E	Excellent
JPL → GSFC	AMSR, etc.	626	625	JPL-PODAAC → GDAAC	615	11985	12600	Excellent	E	Excellent
LaRC → JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	4368	39295	43663	Adequate	A	Adequate
GSFC → LaRC	CERES, MISR, MOPITT	52488	59401	GDAAC → LDAAC	24975	46822	71797	GOOD	A	Adequate
LaRC → GSFC	MODIS, TES	31728	31784	LDAAC → GDAAC	331	50454	50785	GOOD	G	GOOD
US → JAXA	QuikScat, TRMM, AMSR	1986	1986	GSFC-CSAFS → JAXA	446	2005	2451	Adequate	A	Adequate
JAXA → US	AMSR	512	512	JAXA → JPL-SEAPAC	123	2317	2440	Excellent	E	Excellent
JPL → NSIDC	AMSR	1342	1342	JPL-PODAAC → NSIDC SIDADS	97	6206	6303	Excellent	E	Excellent
NSIDC → GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	478	16396	16874	Adequate	A	Adequate
GSFC → NSIDC	MODIS, ICESAT, QuikScat	51157	78410	GSFC-PTH → NSIDC DAAC	12167	90377	102544	GOOD	G	GOOD
Notes:		Flow Requirements (from BAH) include TRMM, Terra, Aqua, QuikScat, ADEOS-II				Ratings Summary				
								Mar-04 Score	Reg Prev	Oct-04 Score
*Criteria:	Excellent	Total Kbps > Requirement * 3				Excellent		5	5	5
	GOOD	1.3 * Requirement <= Total Kbps < Requirement * 3				GOOD		5	4	4
	Adequate	Requirement < Total Kbps < Requirement * 1.3				Adequate		3	4	4
	LOW	Total Kbps < Requirement				LOW		0	0	0
	BAD	Total Kbps < Requirement / 3				BAD		0	0	0
						Total		13	13	13
						GPA		3.15	3.08	3.08

Comparison of measured performance with Requirements:

This graph shows two bars for each source-destination pair. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (March '04, and October '04). Thus as the requirements increase, the same measured performance will be lower in comparison.



Note that this chart shows that the performance to all sites meets current requirements.

Also note that the interpretation of these bars has changed since Sept '01. The bottom of each bar is the average measured MRTG flow to that site (previously daily minimum). Thus the bottom of each bar can be used to assess the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested.

Details on individual sites:

1) ASF

Rating: **N/A**Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/ASF_EMS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
ASF → NESDIS	2.25	2.22	0.72	0.38	2.60
ASF → GSFC-CSAFS	2.74	2.47	1.20		
ASF → JPL-SEAPAC	2.78	2.56	1.19		
GSFC-CSAFS → ASF	2.83	2.75	1.67	.04	2.79

ADEOS Requirement: (Deleted)

Source → Dest	FY	Mbps	Rating
ASF → NESDIS	October '03	1.86	Good

Comments: The 2.6 mbps total from ASF → NOAA is as expected for a 2 * T1 (3.1 mbps) circuit.

The requirement above is from ADEOS, and has been deleted. The remaining ASF requirements are very low, and mostly based on estimated ECS interDAAC queries, not production flows. These flow estimates are not considered reliable enough to use as a basis for testing, so the rating is "N/A". The rating would have remained "Good" vs. the October '03 requirement.

2) GSFC → EDC:

Rating: Continued **Good**Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/EDC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-PTH → EDC-PTH	313.4	279.2	219.4	172.6	451.9
G-DAAC → EDC LPDAAC	191.1	155.2	92.6		

Requirements:

Date	mbps	Rating
March '04	216.6	Good
October '04	285.4	Good

Comments:

The rating is now based on testing between the new GSFC performance test host ("GSFC-PTH"), located outside the ECS firewall and the EDC performance test host ("EDC-PTH"), also located outside the ECS firewall. These results are considerably higher than from GDAAC to LPDAAC, and are considered to more accurately show the capability of the WAN. These comparison of the two results show the effect of high levels of loading on the GDAAC and the ECS firewalls.

The performance was about the same as last month, after improving steadily from mid November through January, mostly due to the upgrade of the GSFC ECS firewall, and also the EDC ECS firewall (median was only 30 mbps in October, 60 mbps in November). The user flow increased from 154 mbps last month, while the iperf testing remained close to steady. The rating remains "Good" for the present, and improves to "Good" for FY '05.

3) JPL:

Ratings: GSFC → JPL: Continued **Excellent**
 JPL → GSFC: Continued **Excellent**
 LaRC → JPL: Continued **Adequate**

Web Pages:

http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_PODAAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_TES.shtml
http://ensight.eos.nasa.gov/Missions/terra/JPL_MISR.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JPL-SEAPAC	6.26	6.08	3.42	0.67	6.75
LaRC DAAC → JPL-TES	40.41	39.30	29.02	4.37	43.67
LaRC DAAC → JPL-MISR	40.51	39.72	25.64		
JPL-PODAAC → GSFC DAAC	12.31	11.99	6.63	0.61	12.60

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → JPL combined	Mar '04	1.60	Excellent
JPL → GSFC combined	Mar '04	0.63	Excellent
LaRC DAAC → JPL-TES	Mar '04	30.6	Adequate
LaRC DAAC → JPL-MISR	Mar '04	18.5	Good
LaRC DAAC → JPL-Combined	Mar '04	49.1	Low

Comments:

GSFC → JPL: Performance on this circuit has been mostly stable since the BOP switchover on 15 August '02. However, in June 2003, performance from MTVS1 to JPL PODAAC, and from G-DAAC to JPL-TES dropped and became noisier. (e.g., from MTVS1 to PODAAC, the median dropped from 5.8 mbps to 2.8). However, the GSFC-CSAFS → JPL-SEAPAC results above (still stable) shows that the problem is not in EMSnet. Testing from GSFC-PTH to JPL-PODAAC averaged about 5 mbps, leading to the conclusion that the limitation is at GSFC.

This month the total from GSFC-CSAFS → JPL-SEAPAC was about the same as last month; well above the requirement; the rating remains "Excellent".

LDAAC → JPL: Performance testing from LDAAC to JPL-TES has been stable at 40 mbps since testing was restored on Feb 29. The route from LDAAC to the JPL-MISR SCF was switched to EMSnet in July '03. The performance for LDAAC to JPL-MISR via EMSnet shown above is, as expected, very similar to TES.

The measured thruput is above both the MISR and TES requirements, but below their combined value. However, the MISR requirement is open to some interpretation. The formal QA flow is only 9.7 mbps. But the science data also flows on the same circuit. This pushes the total MISR flow requirement to 18.5 mbps. When this 18.5 mbps MISR requirement is added to the 30.6 mbps TES requirement, the 49 mbps total requirement is higher than the measured performance, and also higher than the nominal circuit speed. Thus the rating remains "Low". But the rating would be "Adequate" based only on the formal QA requirement.

This configuration is based on a management decision to set the circuit capacity at this level to reduce cost, in the expectation that both projects' requirements are bursty and include contingency. Thus the actual requirements of both projects are expected to be met with this circuit capacity.

JPL → GSFC: The requirement from JPL to GSFC includes flows from NASDA and ASF which go via JPL, and includes GSFC and NOAA destinations. Since many of these flows were related to ADEOS, this requirement dropped substantially with the removal of ADEOS. The iperf flow increased abruptly from a stable 8 mbps to a stable 12 mbps on March 6, apparently due to a PVC change. The combined requirement is now only 0.62 mbps, and the combined 12.6 mbps thruput is more than 3 times that, so the rating remains "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: Continued **Good**
 NSIDC → GSFC: Continued **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NSIDC_EMS.shtml

GSFC ↔ NSIDC Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-PTH → NSIDC	91.6	90.4	37.9	12.2	102.6
GSFC-DAAC → NSIDC	91.3	84.0	15.6		
NSIDC → GSFC-DAAC	16.6	16.4	11.8	0.5	16.9

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → NSIDC	March '04	51.1	Good
NSIDC → GSFC	March '04	13.3	Adequate

Comments:

GSFC → NSIDC: The rating is now based on testing from the new GSFC-PTH to the NSIDC DAAC. This node is outside the GSFC ECS firewall, and has the same peaks, but a higher median and worst values compared to the GDAAC. Performance from the GDAAC to NSIDC improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 35 mbps in October, and 55 mbps in November).

The requirement was increased in January '04 in recognition that the required flows must finish in a limited (less than 24 x 7) workweek. The current performance is still more than 30% above the increased requirement, so the rating remains "Good".

NSIDC → GSFC: Performance from NSIDC to GSFC remains steady, and the rating remains "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)			Requirement	Rating
	Best	Median	Worst		
JPL → NSIDC-SIDADS	6.21	6.21	4.05	1.08	Excellent
GSFC-ISIPS → NSIDC	7.23	6.71	3.76		
LDAAC → NSIDC	4.93	4.78	4.62	0.07	Excellent

Comments:

JPL → NSIDC-SIDADS: Performance has been very steady from JPL since the Aug '02 BOP switchover, exceeding the modest requirement (revised down from 1.5 mbps in November '03)

GSFC-ISIPS → NSIDC: Testing is by ftp pulls by NSIDC from ISIPS. Performance is very steady at 7 mbps, apparently limited by ftp window size. Manual testing using iperf between the same machines in the same direction gets over 20 mbps. Plan to begin reverse iperf testing next month.

LDAAC → NSIDC: Thruput from LDAAC to NSIDC has been steady since August. The very low requirement produces a rating of "Excellent".

5) GSFC ↔ LaRC:

Ratings: GDAAC → LDAAC: ↑ Adequate → **Good**
 LDAAC → GDAAC: Continued **Good**

Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/LARC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GDAAC → LDAAC	56.1	46.8	24.6	25.0	71.8
GSFC-PTH → LDAAC	58.8	42.9	17.0		
LDAAC → GDAAC	51.1	50.5	40.3	0.3	50.8

Requirements:

Source → Dest	Date	Mbps	Rating
GDAAC → LDAAC	Mar '04	52.5	Good
GDAAC → LDAAC	Oct '04	59.4	Adequate
LDAAC → GDAAC	Mar '04	31.7	Good

Comments: **GSFC → LaRC:** User flow increased from 17 mbps last month, while thruput from GDAAC dropped only slightly. This pushed the combined total over 30% above the current requirement, improving the rating to "Good" (but still only "Adequate" vs FY '05 requirement). New testing from GSFC-PTH to LDAAC is similar to testing from GDAAC, but slightly lower results (!). Plan to begin EMSnet testing from GSFC-PTH to LaTIS next month.

LaRC → GSFC: Performance remains stable since the June '03 upgrade to meet the backhaul requirements. The FY '04 requirement jumped from 6.8 mbps to 31.7 mbps in Oct '03, to incorporate this backhaul of all LaRC science outflow via GSFC (which has apparently not started thus far). The thruput is more than 30% above this requirement, so the Jan '04 rating remains "good".

6) NOAA NESDIS:

Rating: Continued **Excellent**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NOAA_NESDIS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → NESDIS	2.93	2.93	1.61	0.58	3.51
ASF → NESDIS	2.25	2.22	0.72		
JAXA (NASDA) → NESDIS	1.59	1.56	0.51		

Requirements:

Source → Dest	FY	Mbps	Rating
GSFC-CSAFS → NESDIS	'04	0.19	Excellent

Comments: With the deletion of the ADEOS flows from ASF, the dominant flow to NOAA is Quikscat data, from GSFC CSAFS.

Note that the 3.5 mbps total from CSAFS → NOAA exceeds the nominal 3.1 mbps for the 2 * T1 circuit. This shows the danger of adding together sampled medians. In this case the iperf tests are usually unaffected by the sporadic user flows, and normally get full circuit bandwidth. Adding the low but significant user flow then exceeds the circuit capacity. Since this is more than 3 times the FY '04 requirement, the rating is "Excellent".

Also note that the flow from NASDA is limited by the TCP window size of the NASDA test source, and the long RTT.

7) US ↔ JAXA (NASDA):

Ratings: US → JAXA: Continued **Adequate**
 JAXA → US: Continued **Excellent**

Web Pages http://ensight.eos.nasa.gov/Networks/emsnet/NASDA_EOC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/GSFC_SAFS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JAXA-EOC	2.25	2.01	1.42	0.45	2.45
JAXA-EOC → JPL-SEAPAC	2.33	2.32	1.43	0.12	2.44
JAXA-EOC → GSFC-CSAFS	1.43	1.41	0.94		

Requirements

Source → Dest	FY	mbps	Rating
GSFC → JAXA	Mar '04	1.99	Adequate
JAXA → US	'03, '04	0.51	Excellent

Comments: US → JAXA: Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate the TCP window size limitation at JAXA). Testing from ASF to NASDA stopped working in January; was restored in April. The requirements above were reduced in November '03, due to the removal of ADEOS flows. Thus the rating remains "Adequate".

But the requirements still include 4 ISTs at JAXA for AMSR-E. Each IST has a requirement for 311 kbps, for a total of 1244 kbps. This requirement causes the rating to be "Adequate", even though the performance was stable. It could be questioned whether JAXA intends to operate all four of the ISTs simultaneously, or whether some ISTs are backups, in which case the network requirements would be reduced to a lower value.

JAXA → US: Performance continues very stable. The requirement was reduced in November '03 due to the removal of ADEOS requirements, increasing the rating to "Excellent".

Note: JAXA has not yet implemented testing with multiple tcp streams. So performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. Therefore, in order to reflect the actual capability of network, the rating is derived from testing from JAXA to JPL. This test uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be as severely limited by the TCP window size. The Trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.

8) GSFC → ERSDAC:

Rating: Continued **Good**

Web Page <http://ensight.eos.nasa.gov/Networks/emsnet/ERSDAC.shtml>

Test Results:

Source → Dest	Medians of daily tests (kbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC → ERSDAC	793	786	454	64	850

Requirements:

Source → Dest	FY	Kbps	Rating
GSFC → ERSDAC	'03, '04	568	Good

Comments: Thruput since June '02, using the 1 mbps ATM connection had been very stable (except for a problem period from 12 November '02 to 3 Jan '03). The requirement was revised down from 668 kbps in November '03, so the total user flow plus iperf is more than 30 % over the requirement, and the rating remains "Good".